



5 Lakes Energy, LLC
503 Mall Court #323
Lansing, MI 48912

TESTIMONY OF DOUGLAS JESTER IN SUPPORT OF PA 295
BEFORE THE MICHIGAN SENATE
ENERGY AND TECHNOLOGY COMMITTEE

I am Douglas Jester, a senior consultant with 5 Lakes Energy, LLC. 5 Lakes Energy is a Michigan-based consultancy that works principally with manufacturers of renewable energy and energy efficiency products and with technologists developing capabilities for such products. I wish to speak briefly today in support of the renewable energy requirements of PA 295 of 2008.

Without reciting my resume, I would like to note that I spent several years as an executive with profit and loss responsibility for MCI, the large telecommunications carrier that has since been merged into Verizon, in the period soon following deregulation of telecommunications. Part of my graduate training was in economics, and I have a particular interest in the economics of network industries including electric power. I have testified in court and before the Federal Energy Regulatory Commission concerning both economic and environmental analysis of electric power projects.

Markets are a highly useful way to organize activity in a society and I generally favor market-based policies when appropriate conditions are met. There are a number of ways in which the supply of electric power violates the critical assumptions behind our economics theorems that show that markets produce optimal outcomes for individuals and society. I want to highlight four in relationship to my support for PA 295.

First, the distribution of electricity within a given territory is a monopoly, both by law and as a consequence of physics and economics. I defer until another time discussion of the appropriate policy with respect to this monopoly but take it as a given for today. What is often ignored in discussing monopoly electric distribution utilities is that they are also monopsonies, the economist's word for the circumstance where a potential supplier of goods or services can only sell to a single buyer. Our regulations of electric utilities have historically NOT well addressed the tendency of a monopsony to take control of their supply chains. In fact, our current regulations encourage our monopsonist electric utilities to own their own generation capacity rather than to acquire electricity in a competitive market. PA 295's requirement that Michigan utilities acquire at least 50% of their renewable energy credits through power purchases is an important and good exception to that problem. The presence of competition as a result of PA 295 has been an important factor in the rapid decline of renewable generation costs that we've experienced.

Second, it is characteristic of all organizations that they tend to keep doing what they are good at. New disruptive technologies almost never come out of a company that is strong in

a particular market. Instead, new companies develop new technologies and either replace the old companies or force them to change technologies in order to survive. In telecommunications, the current giants such as AT&T and Verizon did not develop the commercial implementations of the Internet nor wireless telephones. They used their considerable financial capabilities to buy the new companies that did commercialize those technologies. The incumbent management and business processes of the traditional companies suppressed internal development of such technologies – a process which I observed first hand and in which I was on the side of the technical revolution. Incumbent electric utilities are good at large-scale central generating plants, especially those that burn fossil fuel. Their internal processes and our regulations are finely tuned to support those traditional technologies. Absent competition for electricity supply to these monopsony utilities, new technologies have difficulty emerging successfully in a biased marketplace. PA 295 has begun the process of breaking through the traditional business model of our incumbent utilities. Businesses that develop renewable energy generation, the Public Service Commission staff, and our utilities have all learned a great deal about renewable energy as a result of PA 295

Third, almost all technologies exhibit an experience curve effect in the marketplace. First discovered as an economic phenomenon in the manufacture of aircraft in the 1930s, this idea was brought into general business use by the Boston Consulting Group in the late 1960s. Experience curves show that the cost of producing a good or service declines in a predictable way and rate with cumulative production. You have all likely heard of Moore's law, which described the doubling of microprocessor power every 18 months to 2 years and is an example of an experience curve for a particular technology. Experience curves are manifest in nearly every technology or product, though the rate of learning varies amongst them. There were strong experience curve effects in coal, gas, and nuclear electric power plants which have now largely been exhausted and show little further progress. Renewable energy technologies are now exhibiting very large experience curve effects, with costs of wind and solar declining by 15 – 20% per year as a result of accumulated experience with these technologies. Research and development can help advance technologies, but there is simply no substitute for actual companies doing and learning from the work of deploying the technology to climb down the experience curve for a new technology. PA 295 has provided the opportunity for learning and experience that would be limited in a monopsony market. I would also like to point out that a portion of the experience curve effect is in the global or national marketplace but some of it is local. That's why solar panel prices are almost uniform globally but installed solar systems in Germany, California, and New Jersey are only about 60% as costly as they are in Michigan – they've gained experience in solar deployment that we have not. On the other hand, thanks to PA 295 we've experienced very rapid declines in the cost of wind-powered electricity in Michigan. If, but only if, we continue accumulating experience with renewable energy, it will soon be cheaper than generating electricity from fossil fuels.

Fourth and finally, let me speak to why Michigan policy should favor learning to use renewable generation rather than some other technology as we break up our utility monopsonies. Simply, it is for:

- Distributed generation
- Health and environment
- Economic opportunity

Distributed Generation: Renewable generation technologies are inherently small to medium scale so that they will be spatially distributed and in the long run support a more reliable and resilient power grid, subject to widely distributed ownership that will create a competitive generation market, and deployed more incrementally than traditional generation technologies so that we won't have to pay for the carrying costs of large amounts of unused generation capacity like we do with large coal or nuclear plants.

Health and Environment: Even setting aside concerns about climate change, the well-demonstrated effects of fossil fuel combustion on human health and ecosystem function are substantial. A recent paper by well-regarded economists in the American Economic Review estimated that these non-climate effects from coal combustion cost us almost twice as much in health care, disease, and early death as we pay for the electricity. Renewable generation technologies impose much less such extra-market costs.

Economic Opportunity: Like it or not, the rest of the world is moving into renewable energy technology quite rapidly. It is the fastest growing manufacturing sector globally and nationally, and we want Michigan to host more than our fair share of this new and rapidly growing industry. Please see the attached fact sheet on this opportunity. The renewable energy requirements of PA 295 have been important both symbolically and economically in starting the development of clean energy manufacturing in Michigan. Deploying renewable energy here is essential to the learning process that will enable us to export and supply a substantial share of what is virtually certain to someday be the biggest manufacturing sector in the world, probably exceeding the automobile industry in global gross sales within a decade.

I encourage you to stay the course with the current renewable energy requirements of PA 295 and to consider increasing those requirements in the period following 2015.



Clean Energy Manufacturing Facts

1. Energy is a trillion dollar industry.ⁱ Global investment in clean energy systems rose to \$243 billion in 2010, up from \$186.5 billion in 2009.ⁱⁱ The International Energy Agency estimates \$46 trillion in new capital investment in clean energy infrastructure could occur over the next 40 years – that would result in \$112 trillion in avoided fuel costs over the same period.ⁱⁱⁱ
2. Michigan has \$10 billion in new clean energy investment in the pipeline; \$6 billion^{iv} in advanced energy storage, \$4.1 billion^v in solar, and more than \$270 million in wind turbine component manufacturing and energy efficiency implementations. Michigan is home to over 241 companies in the wind and solar supply chains.
3. Clean technology is the fastest growing sector in Michigan^{vi} and the fastest growing sector in the national economy.^{vii} Renewable energy technology is becoming a mainstream energy solution across the world, validating the forecasted potential of the new energy economy. This means substantial, sustained, new market opportunities as developed nations transition from fossil fuel-based infrastructure to clean energy technologies and the Third World begins to attain its primary energy needs from renewable, highly distributed, clean energy sources.
4. The United States enjoys a \$1.8 billion net trade surplus in the solar industry. The largest contributor to the surplus is Michigan-based Hemlock Semiconductor, the world's largest producer of polycrystalline silicon. US polycrystalline silicon exports totaled \$2.55 billion in 2010.^{viii}
5. In less than three years Michigan has become the North American center for the development and commercialization of advanced energy storage systems with 16 companies establishing new research and production facilities.^{ix} These companies are developing the next generation of energy storage technologies

for electric drivetrains and commercial and stationary energy storage applications.

6. In Michigan, clean energy generation is cheaper than new coal generation. For each technology--wind, biomass, landfill gas, and anaerobic digestion--the average cost is now less expensive than the average cost for new coal generation, according to a 2011 Michigan Public Service Commission report.^x A new DTE Energy 120 MW wind farm is contracted at \$60.05 per Megawatt Hour (MwH) for net energy delivered or \$.06 Kilowatt Hour. This makes the DTE project one of the best rates in the U.S. and the absolute best rate in Michigan for a wind energy project.
7. Michigan ranks 4th in the nation in the number of jobs in the solar industry.^{xi} The solar industry has a projected CAGR of 32 percent with solar deployment moving from 36,000 MWs in 2010 to 800,000 MWs by 2020. Secretary of Energy Steven Chu's "Sunshot" Initiative seeks to lower the "all-in" unsubsidized cost of utility scale solar PV to \$1 per watt within the next decade.^{xii}
8. Future opportunities align with Michigan's strengths in advanced manufacturing, robotics, engineering and materials science. Clean Edge, an authoritative source of research on clean technology industry trends, reports that Michigan is now first among states in clean energy patents – portending robust future opportunities as we commercialize clean energy intellectual property.^{xiii} Maintaining a leadership position in the evolving clean energy technology sectors is critical if we are to capture market share commensurate with Michigan's latent strengths and competitive advantages.
9. The coming clean energy revolution provides an opportunity for reindustrialization and a manufacturing renaissance. Energy experts characterize the coming transformation of the energy sector as "The Third Industrial Revolution."^{xiv} Clean energy technologies should be a key strategy to "reindustrialize" Michigan and recreate – at a higher level of competency and compensation – a new Michigan manufacturing workforce.

10. Energy accounts for 8.8% of the United States' \$13 trillion economy.^{xv} In Michigan in 2007 energy expenditures were \$37 billion. Michigan imports 100% of our coal and uranium fuels, 96% of our transportation fuels and 75% of our natural gas at a total cost of approximately \$26 billion.^{xvi} Producing a higher increment of our energy within our state and reducing expenditures for energy imports directly benefits our economy and creates jobs.
11. If we don't avail ourselves of opportunities clean energy manufacturing present, we will surrender markets to our global competitors.
- The United Kingdom intends to deploy 32 GWs of offshore wind by 2020, investing 75 billion euros and creating 70,000 jobs.^{xvii}
 - Germany alone employs over 300,000 people in the renewable energy sector and has revised its national goal to achieve 47% of electrical power from renewable sources by 2020.^{xviii} More people will soon be employed in the German clean energy technology sector than in the automotive sector.
 - China, starting from near zero, has become the world leader in the production of both wind and solar energy components in less than a decade.^{xix}
12. Recent polling shows that Americans regard having an energy bill providing incentives for clean energy ahead of overhauling the federal tax code, speeding up withdrawal of troops from Afghanistan or expanding drilling for domestic oil and gas. According to Gallop, 83 percent of Americans would favor such a bill and only 15 percent would oppose.^{xx}
13. Michigan was one of three states awarded the annual Golden Shovel Award from Area Development Magazine. The award is given to state governments driving significant job creation through innovative policies, infrastructure improvements, and processes and promotions that attract new employers and investments. Seven of the top 10 projects that helped earn the award for Michigan were in the clean energy industries including projects in advanced batteries, solar energy, hybrid cars, and alternative energy.^{xxi}

ⁱ "A Primer on Energy and the Economy: Energy's Large Share of the Economy." *Institute for Energy Research*. 16 Feb. 2010. Web. 22 Mar. 2011. <<http://www.instituteforenergyresearch.org/2010/02/16/a-primer-on-energy-and-the-economy-energys-large-share-of-the-economy-requires-caution-in-determining-policies-that-affect-it/>>.

ⁱⁱ Morales, Alex. "Low-Carbon Energy Investment Hit a Record \$243 Billion in 2010." *Business & Financial News*. Bloomberg, 11 Jan. 2011. Web. 21 Mar. 2011. <<http://www.bloomberg.com/news/2011-01-11/low-carbon-energy-investment-hit-a-record-243-billion-in-2010-bnef-says.html>>.

ⁱⁱⁱ "IEA Clean Energy Options." *World Coal Association*. Web. 22 Mar. 2011. <<http://www.worldcoal.org/resources/ecoal/ecoal---archive/iea-clean-energy-options/>>.

^{iv} Granholm, Jennifer. "Granholm: Next Week Marks One-Year Anniversary of Milestone in Vehicle Electrification." *Building MI Future: Michigan's Recovery & Reinvestment Plan*. State of Michigan, 30 July 2010. Web. 21 Mar. 2011. <<http://www.michigan.gov/recovery/0,1607,7-172-52829-241500--,00.html>>.

^v Schneider, Keith. "Midwest Emerges as Center for Clean Energy." *Energy & Environment*. New York Times, 30 Nov. 2010. Web. 22 Mar. 2011. <http://www.nytimes.com/2010/12/01/business/energy-environment/01solarcell.html?_r=3&partner=rss&emc=rss>.

^{vi} Wacławek, Richard, and Bruce Weaver, comps. *Michigan Green Jobs Report 2009*. Rep. Detroit: Bureau of Labor Market Information & Strategic Initiatives, 2009. Department of Energy, Labor & Economic Growth, May 2009. Web. 22 Mar. 2011. <http://www.michigan.gov/documents/nwlb/GJC_GreenReport_Print_277833_7.pdf>.

^{vii} Urahn, Susan, and Joshua Reichert. "Clean Energy Economy: Repowering Jobs, Businesses and Investments Across America." The Pew Charitable Trusts, June 2009. <http://www.pewtrusts.org/our_work_detail.aspx?id=690>.

^{viii} <http://www.greentechmedia.com/articles/read/Report-Trade-Balance-The-U.S.-is-a-Net-Exporter-of-Solar-Products/>

^{ix} "Michigan Energy Storage & Advanced Energy Systems." *The Michigan Advantage*. Michigan Economic Development Corporation. <<http://www.michiganadvantage.org/Targeted-Initiatives/Advanced-Energy-Storage/Default.aspx>>.

^x Isigou, Orjiakor, Monica Martinez, and Greg White. *Report on the Implementation of the P.A. 295 Renewable Energy Standard and the Cost-Effectiveness of the Energy Standards*. Rep. Michigan Public Service Commission and The Department of Energy, Labor & Economic Growth, 15 Feb. 2011. Web. 11 May 2011. <http://www.michigan.gov/documents/mpsc/Report_on_Implementation_of_PA_295_RE_Standards_and_Cost_Effectiveness_of_Standards_345871_7.pdf>.

^{xi} *National Solar Jobs Census 2010*. Rep. The Solar Foundation, Oct. 2010. Web. 21 Mar. 2011. P. 63. <<http://www.thesolarfoundation.org/sites/thesolarfoundation.org/files/Final%20TSF%20National%20Solar%20Jobs%20Census%202010%20Web%20Version.pdf>>.

^{xii} Simmons, G. "Sec. Chu Announces More "Sunshot" Details." Weblog post. *Energy Blog*. Department of Energy, 4 Feb. 2011. Web. 22 Mar. 2011. <<http://blog.energy.gov/blog/2011/02/04/sec-chu-announces-more-sunshot-details>>.

^{xiii} "California, Oregon, and Massachusetts Lead List of Top 10 Clean-Energy States." *Clean Edge*. Business Wire, 7 Dec. 2010. Web. 21 Mar. 2011. <http://www.businesswire.com/news/home/20101207005888/en/California-Oregon-Massachusetts-Lead-List-Top-10>>.

^{xiv} "State Energy Data 2008: Prices and Expenditures." *Department of Energy*. Energy Information Association, 2008. <http://www.eia.doe.gov/states/sep_sum/html/pdf/sum_ex_tot.pdf>.

^{xv} "Energy Consumption, Expenditures." *Department of Energy*. Energy Information Association, 2009. Web. 22 Mar. 2011. <http://www.eia.doe.gov/emeu/aer/pdf/pages/sec1_13.pdf>.

^{xvi} "Michigan Energy Overview." *Department of Labor and Economic Growth*. Michigan Public Service Commission, Sept. 2008. <<http://www.dleg.state.mi.us/mpsc/reports/energy/energyoverview/>>.

^{xvii} Bradbury, John. "Crown Estate Announces Round 3 Wind Licences." *Offshore247*. 1 Aug. 2010. Web. 22 Mar. 2011. <<http://www.offshore247.com/news/art.aspx?id=15751>>.

^{xviii} "New Think: Act Content on Green Business." Roland Berger, 30 Aug. 2010. Web. 22 Mar. 2011. <http://www.rolandberger.com/news/2010-08-30-rbsc-news-taC_GreenBusiness.html>.

^{xix} Hargreaves, Steve. "China Winning Renewable Energy Race." *CNNMoney*. CNN, 22 Sept. 2010. Web. 22 Mar. 2011. <http://money.cnn.com/2010/09/21/news/international/china_renewables/index.htm>.

^{xx} Jones, Jeffrey M. "In U.S., Alternative Energy Bill Does Best Among Eight Proposals." *Gallup*. 2 Feb. 2011. Web. 22 Mar. 2011. <<http://www.gallup.com/poll/145880/Alternative-Energy-Bill-Best-Among-Eight-Proposals.aspx>>.

^{xxi} *Gold & Silver Shovel Awards: Top Projects by State in 2010*. Rep. Area Development Magazine, 15 Apr. 2011. Web. 11 May 2011. <http://www.areadevelopment.com/article_pdf/id32608_GoldSilverShovelCharts.pdf>.